

U. S. Application No. 10/825,348  
Attorney Docket No. 2003B043D  
Reply to Office Action of January 12, 2007  
Response dated April 25, 2007

### LISTING OF THE CLAIMS:

This listing of claims will replace all prior versions, and listings of claims in the application.

#### **We Claim:**

1. (Currently Amended) An adhesive comprising 1) functionalized component and 2) an olefin polymer comprising 50 weight % or more of an alpha-olefin having 3 to 30 carbon atoms, where the olefin polymer has a Dot T-Peel of 1 N or more on Kraft paper, an Mw of 10,000 to 100,000, a g' measured at the Mz of 0.95 or less and a heat of fusion of 1 to 70 J/g; where the functionalized component is selected from the group consisting of functionalized polymers, functionalized oligomers and beta nucleating agents, wherein the beta nucleating agents are materials that cause at least 5% beta crystallization of the crystallization that occurs, with a K value of 0.05 or more; and where the Gardner color of the adhesive does not change by more than 7 Gardner units when the adhesive has been heat aged at 180°C for 48 hours as compared to the Gardner color of the unaged composition.
2. (Currently Amended) An adhesive comprising 1) functionalized component and 2) an olefin polymer comprising 50 weight % or more of one or more alpha-olefins having 3 to 30 carbon atoms, where the olefin polymer has a Dot T-Peel of 1 N or more, an Mw of 10,000 to 60,000, a g' measured at the Mz of 0.98 or less, and a heat of fusion of 1 to 50 J/g; where the functionalized component is selected from the group consisting of functionalized polymers, functionalized oligomers and beta nucleating agents, wherein the beta nucleating agents are materials that cause at least 5% beta crystallization of the crystallization that occurs, with a K value of 0.05 or more; and where the Gardner color of the adhesive does not change by more than 7 Gardner units when the adhesive has been heat aged at 180°C for 48 hours as compared to the Gardner color of the unaged composition.
3. (Currently Amended) An adhesive comprising 1) functionalized component and 2) an olefin polymer comprising a homopolypropylene or a copolymer of propylene and up to 5 mole% ethylene having:
  - a) an isotactic run length of 1 to 30,

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- b) a percent of r dyad of greater than 20%, and
- c) a heat of fusion of 70 J/g or less;

where the functionalized component is selected from the group consisting of functionalized polymers, functionalized oligomers and beta nucleating agents, wherein the beta nucleating agents are materials that cause at least 5% beta crystallization of the crystallization that occurs, with a K value of 0.05 or more; and where the Gardner color of the adhesive does not change by more than 7 Gardner units when the adhesive has been heat aged at 180°C for 48 hours as compared to the Gardner color of the unaged composition.

- 4. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a percent crystallinity of between 5 and 40 % or less.
- 5. (Original) The adhesive of claim 1, 2 or 3 wherein the g' is 0.90 or less.
- 6. (Original) The adhesive of claim 1, 2 or 3 wherein the g' is 0.80 or less.
- 7. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a viscosity at 190 °C of 90,000 mPa•s or less.
- 8. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a viscosity at 160 °C of 8,000 mPa•s or less.
- 9. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a heat of fusion greater than 10 J/g.
- 10. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has heat of fusion of from 20 to 70 J/g.
- 11. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has heat of fusion of from 30 to 60 J/g.

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12. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a percent crystallinity of 10-30 %.
13. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has tensile strength at break of 0.75MPa or more.
14. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a SAFT of 100-130°C.
15. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has an Mz/Mn of 2 to 200.
16. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a Shore A hardness of 20-90.
17. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a Dot T-Peel of between 3 and 10,000 N.
18. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a Dot T-Peel of between 10 and 2,000 N.
19. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a tensile strength at break of 0.6 MPa or more.
20. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a Tg of between 5 and -65°C.
21. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer comprises at least 50 weight % propylene.

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22. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer comprises at least 50 weight % propylene and up to 50 weight % of a comonomer selected from the group consisting of ethylene, butene, hexene, octene, decene, dodecene, pentene, heptene, nonene, 4-methyl-pentene-1, 3-methyl pentene-1, 3,5,5-trimethyl-hexene-1, and 5-ethyl-1-nonene.

23. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer comprises at least 50 weight % propylene and 5 weight % or less of ethylene.

24. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer comprises up to 10 weight % of a diene selected from the group consisting of: butadiene, pentadiene, hexadiene, heptadiene, octadiene, nonadiene, decadiene, undecadiene, dodecadiene, tridecadiene, tetradecadiene, pentadecadiene, hexadecadiene, heptadecadiene, octadecadiene, nonadecadiene, icosadiene, heneicosadiene, docosadiene, tricosadiene, tetracosadiene, pentacosadiene, hexacosadiene, heptacosadiene, octacosadiene, nonacosadiene, triacontadiene, cyclopentadiene, vinylnorbornene, norbornadiene, ethylidene norbornene, divinylbenzene, and dicyclopentadiene.

25. (Original) The adhesive of claim 1, 2 or 3 wherein tackifier is present at 1 to 60 weight %.

26. (Original) The adhesive of claim 1, 2 or 3 wherein tackifier is present and is selected from the group consisting of aliphatic hydrocarbon resins, aromatic modified aliphatic hydrocarbon resins, hydrogenated polycyclopentadiene resins, polycyclopentadiene resins, gum rosins, gum rosin esters, wood rosins, wood rosin esters, tall oil rosins, tall oil rosin esters, polyterpenes, aromatic modified polyterpenes, terpene phenolics, aromatic modified hydrogenated polycyclopentadiene resins, hydrogenated aliphatic resin, hydrogenated aliphatic aromatic resins, hydrogenated terpenes and modified terpenes, hydrogenated rosin acids, hydrogenated rosin esters, derivatives thereof, and combinations thereof.

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27. (Original) The adhesive of claim 1, 2 or 3 wherein the adhesive further comprises one or more waxes selected from the group consisting of polar waxes, non-polar waxes, Fischer-Tropsch waxes, oxidized Fischer-Tropsch waxes, hydroxystearamide waxes, polypropylene waxes, polyethylene waxes, wax modifiers, and combinations thereof.
28. (Original) The adhesive of claim 1, 2 or 3 wherein the adhesive further comprises one or more additives selected from the group consisting of plasticizers, oils, stabilizers, antioxidants, pigments, dyestuffs, polymeric additives, defoamers, preservatives, thickeners, rheology modifiers, humectants, fillers and water.
29. (Original) The adhesive of claim 1, 2 or 3 wherein the adhesive further comprises one or more aliphatic naphthenic oils, white oils, combinations thereof, or derivatives thereof.
30. (Original) The adhesive of claim 1, 2 or 3 wherein the adhesive further comprises one or more plasticizers selected from the group consisting of mineral oils, polybutenes, phthalates, and combinations thereof.
31. (Original) The adhesive of claim 1, 2 or 3 wherein the adhesive further comprises one or more plasticizers selected from the group consisting of di-iso-undecyl phthalate, di-isononylphthalate, dioctylphthalates, combinations thereof, or derivatives thereof.
32. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a peak melting point between 80 and 140°C.
33. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a Tg of 0°C or less.
34. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a melt index of 50 dg/min or more.

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35. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a set time of 30 seconds or less.
36. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a  $T_c$  that is at least 10 °C below the  $T_m$ .
37. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has an  $I_{10}/I_2$  of 6.5 or less.
38. (Original) The adhesive of claim 1, 2 or 3 wherein the olefin polymer has a range of crystallization of 10 to 60°C wide.
39. (Original) The adhesive of claim 1, 2 or 3 wherein the functionalized component is present at 0.001 to 50 weight%.
40. (Original) The adhesive of claim 1, 2 or 3 wherein the functionalized component is present at 0.1 to 10 weight%.
41. (Original) The adhesive of claim 1, 2 or 3 wherein the functionalized component comprises functionalized polymer.
42. (Original) The adhesive of claim 1, 2 or 3 wherein the functionalized component comprises functionalized polymer selected from the group consisting of maleated polyethylene, maleated metallocene polyethylene, maleated metallocene polypropylene, maleated ethylene propylene rubber, and functionalized polyisobutylene.
43. (Original) The adhesive of claim 1, 2 or 3 wherein the functionalized component comprises functionalized oligomer.

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44. (Original) The adhesive of claim 1, 2 or 3 wherein the functionalized component comprises functionalized hydrocarbon resin.

45. (Original) The adhesive of claim 1, 2 or 3 wherein the functionalized component comprises a beta-nucleating agent.

46. (Original) The adhesive of claim 1, 2 or 3 wherein the functionalized component comprises beta nucleating agent selected from the group consisting of N,N'-diphenylhexanediamide, N,N'-dicyclohexylterephthalamide, N,N'-dicyclohexyl-2,6-naphthalenedicarboxamide, N,N'-dicyclohexanecarbonyl-p-phenylenediamine, N,N'-dibenzoyl-1,5-diaminonaphthalene, N,N'-dibenzoyl-1,4-diaminocyclohexane or N,N'-dicyclohexanecarbonyl-1,4-diaminocyclohexane, N-cyclohexyl-4-(N-cyclohexylcarbonylamino)benzamide, N-phenyl-5-(N-benzoylamino)pentanamide, sorbitol, salicylic acid, p-hydroxybenzoic acid, zinc 3,5-di-tert-butylsalicylate, 2-naphthoic acid, phenyl acetic acid, terephthalic acid, anthranilic acid, 3,3-diphenylpropionic, tetra butyl ammonium chloride, naphthalic acid, benzoin, ascorbic acid, adipic acid, tertabutyl benzoate, dodecylbenzenesulfonic acid sodium salt, 4-dodecylbenzenesulfonic acid, 4,4-bis(4-hydroxyphenyl)valeric acid, diphenic acid, 4-isopropylbenzoic acid, Millad 3988tm, neodecanoic acid, abietic acid, sodium benzoate, succinic anhydride, phenol, benzoic acid, benzyl alcohol, benzyl amine, alkyl substituted succinates (preferably C1 to C40 alkyl substituted succinates), substituted di(benzylidene)-D-sorbitols, 1,3:2,4-di(benzylidene)-D-sorbitol, 1,3:2,4-bis(3,4-dimethylbenzylidene)-D-sorbitol, red quinacridone dye, gamma-crystalline form of a quinacridone colorant, the bisodium salt of orthophthalic acid, the aluminum salt of 6-quinizarin sulfonic acid, the aluminum salt of isophthalic and the aluminum salt of terephthalic acids.

47. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional group selected from the group consisting of organic acids, organic amides, organic amines, organic esters, organic anhydrides, organic alcohols, organic acid halides, organic peroxides, and salts thereof.

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48. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional group selected from the group consisting of carboxylic acids, esters of the unsaturated carboxylic acids, acid anhydrides, di-esters, salts, amides, imides, aromatic vinyl compounds hydrolyzable unsaturated silane compounds and unsaturated halogenated hydrocarbons.

49. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional group selected from the group consisting of maleic anhydride, citraconic anhydride, 2-methyl maleic anhydride, 2-chloromaleic anhydride, 2,3-dimethylmaleic anhydride, bicyclo[2,2,1]-5-heptene-2,3-dicarboxylic anhydride and 4-methyl-4-cyclohexene-1,2-dicarboxylic anhydride, acrylic acid, methacrylic acid, maleic acid, fumaric acid, itaconic acid, citraconic acid, mesaconic acid, crotonic acid, bicyclo(2.2.2)oct-5-ene-2,3-dicarboxylic acid anhydride, 1,2,3,4,5,&g, 10-octahydronaphthalene-2,3-dicarboxylic acid anhydride, 2-oxa-1,3-diketospiro(4.4)non-7-ene, bicyclo(2.2.1)hept- 5-ene-2,3- dicarboxylic acid anhydride, maleopimaric acid, tetrahydrophtalic anhydride, norborn-5-ene-2,3-dicarboxylic acid anhydride, nadic anhydride, methyl nadic anhydride, himic anhydride, methyl himic anhydride, and x-methyl-bicyclo(2.2.1)hept-5-ene-2,3- dicarboxylic acid anhydride (XMNA).

50. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional polymer where the polymer of the functional polymer is syndiotactic polypropylene.

51. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional polymer where the polymer of the functional polymer is syndiotactic rich polypropylene.

52. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional polymer where the polymer of the functional polymer is polypropylene having a weight average molecular weight of 15,000 or less and a crystallinity of 5% or more.

53. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional polymer where the polymer of the functional polymer is polypropylene having a



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weight average molecular weight between 3,000 to 15,000 and a crystallinity of 5% or more functionalized with up to 10 weight% of maleic anhydride.

54. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional polymer where the polymer of the functional polymer is polypropylene having:

- 1) a heat of fusion from about 0.5 J/g to about 25 J/g; and /or
2. a crystallinity of about 0.25% to about 15%; and/or
- 3) a melting point of from about 25°C to about 75°C; and / or
- 4) a weight average molecular weight, prior to functionalization, of 10,000 to 500,000;

and/or

- 5) an  $M_w/M_n$  between 1.8 to 5; and /or
- 6) a Mooney viscosity ML (1+4)@125°C less than 100.

55. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional polymer where the polymer of the functional polymer is syndiotactic rich polypropylene having at least 50% [r] dyads.

56. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional polymer where the polymer of the functional polymer is syndiotactic rich polypropylene having at less than or equal to 99% [r] dyads.

57. (Original) The adhesive of claim 1, 2 or 3 wherein the functional component comprises a functional polymer where the polymer of the functional polymer is a random copolymer of propylene and an alpha olefin wherein the propylene copolymer has:  
a crystallinity of from 0.1 to 50%;  
a propylene content from 68 to 92 mole percent;  
a comonomer content from 8 to 32 mole percent;  
a melting point from 25°C to 105°C; and  
a heat of fusion of less than 45 J/g.

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58. (Currently Amended) A process to make the adhesive of ~~any of the above claims~~ claims 1, 2 or 3, comprising the steps of contacting the olefin polymer with the functionalized component to produce an admixture.
59. (Original) A tie layer comprising the adhesive of claim 1, 2 or 3.
60. (Original) A paint primer comprising the adhesive of claim 1, 2 or 3.
61. (Original) A package comprising the adhesive of claim 1, 2 or 3.
62. (Original) An article comprising the adhesive of claim 1, 2 or 3.
63. (Original) A disposable article comprising the adhesive of claim 1, 2 or 3.
64. (Original) A diaper comprising the adhesive of claim 1, 2 or 3.
65. (Original) A film comprising the adhesive of claim 1, 2 or 3.
66. (Original) A laminate comprising the adhesive of claim 1, 2 or 3.
67. (Original) A nonwoven fabric comprising the adhesive of claim 1, 2 or 3.
68. (Original) A pressure sensitive adhesive comprising the adhesive of claim 1, 2 or 3.
69. (Original) A hot melt comprising the adhesive of claim 1, 2 or 3.
70. (Original) A tape comprising the adhesive of claim 1, 2 or 3.
71. (Original) The adhesive of claim 1, 2 or 3 wherein the adhesive shows substrate fiber tear at -10 °C when the adhesive is applied to 50 pound corrugated cardboard.

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72. (Original) The adhesive of claim 1, 2 or 3 wherein the adhesive shows substrate fiber tear at -10 °C of at least 5 % when the adhesive is applied to 50 pound corrugated cardboard.

73. (Original) The adhesive of claim 1, 2 or 3 wherein the adhesive has three point bend deflection at -10 °C of at least 100% greater than the same adhesive without the functional component.